Canada. Department of Communications.

# MSAT:
# Fact Sheet Documentation

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## MSAT

### WHAT IT IS

MSAT stands for Mobile SATellite, a proposed communications system that would provide more effective and reliable two-way radio and radio telephone services to all parts of Canada, without restriction on distance. MSAT would be used for communications by those travelling on foot, by land vehicle, airplane or ship, supplementing today's short-range mobile communications services.

MSAT is another step for Canada in advancing its leadership in the field of satellite communications. While most satellite ground terminals today require relatively large, expensive dish antennas, one MSAT could serve thousands of small mobile terminals similar to those used in taxis or in the cockpit of a plane. MSAT would provide mobile communications to areas now unserved at a cost to the user comparable to mobile radio or mobile telephone rates in the major cities. Such services would be particularly useful in Canada, where the population is scattered over an enormous area.

The Government of Canada has conducted a great deal of research into the feasibility of MSAT. If a decision to go ahead is made, Canada would be the first country in the world with a domestic mobile satellite communications system.

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## TYPES OF MOBILE COMMUNICATIONS

There are three types of mobile communications in operation today. All are limited to an effective range of about 80 kilometres from a base station.

Mobile telephone. This is a system of two-way radio telephones linked to the telephone networks. For example, the occupant of a car with a mobile telephone can speak to anyone in the local dialing area or call long distance, provided the vehicle stays within the mobile telephone coverage area.

Radio mobile. This enables the occupant of a vehicle to speak with a specific base station. About 85 per cent of today's mobile communications are of this type. There are thousands of independent networks owned by industry or by government for their own use. The police are among the largest users. Radio mobile service is also used for ambulance services, winter road maintenance, forest fire fighting and service trucks operated by repair companies.

Mobile data display. This relatively new system is used by many police forces and increasingly by taxi companies. The occupant of a moving vehicle can call up directly, on a video display, information from a computer, without an intermediary such as a dispatcher. A policeman on patrol, for example, can check a vehicle's ownership without having to speak to anyone at headquarters.

MSAT would allow all three types of communications to be extended to all parts of Canada without restriction on distance. It could also offer new features such as confidential communications and automatic vehicle location and identification.

## TYPICAL USES OF MSAT

If a mobile communications satellite system were in place, it could meet a number of needs, for example:

An industrial sales representative travelling in a remote area in a car equipped for voice and digital communications could check out the availability of equipment through a data bank, then place an urgent order for delivery to the nearest airport within hours, instead of the days or weeks which would normally be needed. It would also be simple for the sales representative to get price lists and delivery data for equipment -- updated each day -- for presentation to a customer in the next town.

A commercial pilot operating in what would otherwise be poor radio conditions in the far north could talk to other pilots and a base station about a suspected disaster. With a mobile satellite, such communications could save lives through immediate rescue operations, or avoid unnecessary air missions if the concern proved unfounded.

A small fishing or pleasure boat on the seacoast could be assured of instant and sure communications with other boats and a base station in case of trouble.

In short, MSAT has uses wherever people wish to communicate reliably and quickly in this country of vast distances.

## THE STORY SO FAR

Civilian and military experts have been studying the idea of a mobile satellite communications system for Canada since 1972. It was a large step forward when, in 1979, the World Administrative Radio Conference authorized the use of the 806-890 megahertz (MHz) band for mobile communications satellite services in North and South America.

The next year, the United States National Aeronautics and Space Administration (NASA) began discussions with the Canadian Department of Communications respecting planning and feasibility studies for a demonstration program. The two countries continue to work together in the hope that MSAT will be available not only to Canada, but for use throughout North America.

Early work on MSAT indicated enough market potential to ensure commercial success when the technology is developed. In 1980, the Government of Canada authorized $2.2 million to explore uses and to allow technical work to continue in the planning for a demonstration mobile communications satellite.

During this first phase, 15 Canadian companies studied the market, assessed commercial viability and cost-benefits for users, and drew up preliminary concepts for a demonstration project and later commercial systems, as well as for ground terminals.

A little more than a year later, prospects were favorable enough for the Government of Canada to approve further engineering, marketing and socio-economic studies. This work will culminate in 1984 with a proposal for the construction and launching of MSAT, with cost and schedule targets. If the proposal illustrates that the technology is economically viable, the demonstration satellite could receive approval and be launched as early as 1987. MSAT would be active for seven years, with the likelihood of a commercial version of the satellite in place well before the demonstration satellite has run its course.

## ITS COST

So far, $2.2 million has been spent on feasibility studies and a further $17 million has been authorized by the Department of Communications for engineering and economic studies to define the characteristics of a commercially viable mobile communications satellite system.

The cost of the MSAT system, including military participation, is estimated in the range of $400 to $450 million (1982 dollars). This would include initial studies; design, construction and launch of the demonstration satellite; construction and assembly of an on-ground space satellite; launching costs; and procurement and operation of an extensive network of earth stations including some 2,000 land, sea and air mobile terminals and six central control stations.

The main goal of the program, however, is extension of new services to the people of Canada, not technology development. Compared with the Hermes communications technology satellite developed by Canada and launched in 1976, MSAT will be based to a much greater extent on existing technology. This will keep costs down, ensure maximum Canadian industrial content and emphasize development of services.

In a significant departure from previous experimental systems, the demonstration MSAT is expected to result in significant cost recovery by generating some $50 million in revenue. As the commercial viability of services is proven, MSAT's capacity will be leased to users. Design of the demonstration spacecraft will be readily adaptable to a commercially viable, fully operational satellite system capable of handling up to 140,000 mobile stations by the year 2000.

Cost-sharing

The decision to go ahead with an MSAT demonstration system will depend in large part on government efforts to find domestic and international partners. Discussions are underway with Canadian telecommunications carriers and potential users, as well as with NASA, on such a cost-sharing approach. Planned MSAT capacity will be sufficient for many users to experiment with the system and to reduce the per-minute costs of satellite transmission.

ESTIMATING THE MARKET: VOLUME

Outside the larger Canadian cities, more than half the present users of mobile communications have problems with inadequate range, noise, interference and

distortion. Many others have no access to mobile services. These are potential customers to whom MSAT would provide clear communications with, for practical purposes, an unlimited range.

It is expected that mobile radio would continue to be the type of service most in demand, followed by the personal portable radio and mobile telephone. The following data, based on a DOC-sponsored study by Woods Gordon, is a projection of the market penetration of all types of MSAT ground terminals in a 14-year period beginning with the launch of the demonstration satellite:

| 1987 | 1991 | 1996 | 2001 |
|---|---|---|---|
| 700 | 10,200 | 56,000 | 140,000 |

## ESTIMATING THE MARKET: REGIONS

In 1981, 450,000 mobile radios were licensed in Canada. Not surprisingly, their distribution does not correspond to population densities. For example, the Prairies and the Northwest Territories had only 17 per cent of the population of Canada, but 30 per cent of the mobile radios. This was also the area of by far the greatest increase in use between 1973 and 1981 (275 per cent).

## ESTIMATING THE MARKET: USERS

### Agriculture and fishing

In five years, the number of farmers using mobile communications has grown from 2,000 to 10,000; the projection for 2001 is 53,000. For large farms remote from metropolitan areas, MSAT would be of special benefit.

With modernization of fishing fleets and greater emphasis on safety, the fisheries industry could well be a growing user of MSAT, particularly for new, low-cost voice and data terminals that can provide reliable, up-to-date information about weather, sea conditions, shipping schedules, etc.

## Forestry

The forestry industry is likely to increase its share of the country's mobile radios from five per cent to eight per cent by the end of the century. The main use would be in logging operations.

## Mining, petroleum and natural gas

Five years ago, the mining, petroleum and natural gas industries used only three per cent of the country's mobile radios. They now use six per cent and this will probably rise to 15 per cent by 2001. This is partly due to the projected increase in demand for natural resources, and partly because the availability of MSAT in remote areas will open up new uses of mobile radio. MSAT will be particularly useful to nomadic mining services such as site preparation, well equipment and maintenance.

## Manufacturing and construction

It is estimated that the manufacturing sector will use about 59,000 mobile units by the end of the century. Most of these would serve the immediate area of a manufacturing plant and would be, therefore, relatively light users of an MSAT. The construction industry also is expected to be a relatively minor user.

## Transportation and communications

The whole of the transportation sector is expected to need an impressive 188,000 mobile units by 2001. Much of the growth is likely to come from sophisticated new applications of communications such as the monitoring of every aspect of rolling stock and stationary equipment on the railways of the future.

The telephone and broadcasting industries together use 16,000 mobile units, with a projected increase to 33,000 in 2001.

Utilities

Electricity, gas and water companies use 22,000 mobile units, projected to rise to 55,000 in 2001.

Retailers, wholesalers and service industries

Retail and wholesale enterprises use mobile units less than the service industries, which include commercial services, education, health and welfare. Together, they are expected to require 134,000 sets by 2001.

Government

Governments have been using mobile equipment long and extensively. With a projection of 136,000 units in 2001, they are among MSAT's best potential customers.

FUTURE DECISIONS

Major new projects in satellite communications pose important and difficult questions for government. They require heavy investment for development, and decisions must be made on how much of the final user cost should be paid by the nation and how much by the consumer. This is a particularly active question in the pioneering stages of each new advance in technology when the domestic and foreign markets have not been established.

There are risks involved. As with any business enterprise, there are hazards in predicting markets 20 years in the future at a time of exploding technological change. In the extraordinarily complex technology of satellites, there is always some risk that the equipment will not perform as expected. Canada has enjoyed a record of such unbroken success in satellite programs that it is easy for the layman to forget that any risk exists.

On the positive side, there are prospects of impressive financial and other dividends. Canada is a well-placed pioneer. Development of new satellite

systems is tailored specifically to reduce uncertainty. We were bold enough to become the third country in the world to design and build a satellite; we were the first with a commercial domestic satellite system in geostationary orbit. We have built an industry, developed an enviable cadre of experts and are now exporting both our expertise and our space products. Future returns on a large scale can be expected from exports and from the existence of a growing industry providing employment for highly skilled people. The alternative to such an industry is not only a brain drain but a continued loss on foreign exchange as we buy equipment and expertise from other countries.

When all the facts, cost-sharing agreements and the best possible projections have been assembled by late 1983, the government will have to make the decision on whether to construct and launch a demonstration MSAT. It will also have to decide, on the basis of discussions with the United States, whether MSAT would be built for Canadians only, or expanded to cover the United States on a cost-sharing basis. If MSAT goes ahead, decisions will be required on the cost to users and on the techniques for developing markets.

In these major decisions, it is unlikely that national pride will be a factor, but the future unity of our nation may be. We are not just another country with an opportunity for a large investment. We have perhaps the most challenging geography in the world and, therefore, the greatest need for modern communications technology. Consequently, all Canadians have a stake in the MSAT decision.

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